MYANMAR BOARD OF ENGINEERS

PROFESSIONAL ENGINEER

(PE)

REGISTRATION REQUIREMENTS

CTOBER 2012

အသက်မွေးဝမ်းကျောင်းဆိုင်ရာ အင်ဂျင်နီယာ Professional Engineer (PE)

၁။ ASEAN VISION ၂၀၂၀ အရ အာဆီယံအဖွဲ့ဝင် နိုင်ငံများအတွင်း အာဆီယံဒေသတွင်း ကုန်သွယ်ရေး အဆောက်အအုံ ASEAN ECONOMIC COMMUNITY (AEC) ဖွဲ့စည်းတည်ထောင်ခြင်း၊ အာဆီယံနိုင်ငံများအတွင်း လွတ်လပ်သော ဝန်ဆောင်မှုလုပ်ငန်းများ သွားလာလုပ်ကိုင်ခွင့်ကို ၂၀၁၅ ခုနှစ်တွင် စတင်အကောင်အထည်ဖော် ဆောင်ရွက်တော့မည် ဖြစ်ပါသည်။

၂။ ဝန်ဆောင်မှုအခန်းကဏ္ဍတွင် အင်ဂျင်နီယာဝန်ဆောင်မှု လုပ်ငန်းများလည်းပါဝင်ခဲ့ပြီး၊ ၂၀၀၅ခုနှစ်၊ ဒီဇင်ဘာလ၊ (၉) ရက်နေ့တွင် အတည်ပြု သဘောတူလက်မှတ်ရေးထိုးခဲ့ကြသော Mutual Recognition Arrangement on Engineering Service (MRA on Engineering Service) အရ အဖွဲ့ဝင်နိုင်ငံများအတွင်း အပြန်အလှန် သဘောတူ အကောင်အထည်ဖော် ဆောင်ရွက်လျက်ရှိရာ၊ အသက်မွေးဝမ်းကျောင်းဆိုင်ရာ အင်ဂျင်နီယာ Professional Engineer (PE) များ ပေါ်ထွက်လာရေးသည်လည်း အရေးပါသည့် လုပ်ငန်းတစ်ရပ်ဖြစ်နေပါသည်။

၃။ Professional Engineer များပေါ်ပေါက်ရေးသည် နိုင်ငံတစ်နိုင်ငံအတွက် အင်ဂျင်နီယာ ပညာရပ်ဖွံ့ဖြိုးတိုးတက်ရေးအတွက် အထူးလိုအပ်ပါသည်။ နိုင်ငံတကာတွင် PE များမှတ်ပုံတင်ရန်စနစ် အသီးသီးရှိကြပါသည်။ PE စနစ်မှ အောက်ဖော်ပြပါ အကျိုးကျေးဇူးများ ရရှိမည် ဖြစ်ပါသည်-

(က) အများပြည်သူဘေးအန္တရာယ်ကင်းရှင်းရေး (Public Safety)

(ခ) နိုင်ငံအချင်းချင်းလွယ်ကူချောမွေ့စွာ ကူးလူးဆက်ဆံနိုင်ရေး (Mobility)

(ဂ) အသက်မွေးဝမ်းကျောင်းပညာ တိုးတက်မြင့်မားစေရေး (Professional Development)

(ဃ) အသိအမှတ်ပြုရေး (Recognition)

၄။ မြန်မာနိုင်ငံတွင် PE များ စိစစ်မှတ်တမ်းတင်ရန်အတွက် မြန်မာနိုင်ငံအင်ဂျင်နီယာစိစစ်ရေးဘုတ်အဖွဲ့ (Myanmar Board of Engineers) ကို ဖွဲ့စည်းတာဝန်ပေးထားခဲ့ပါသမြဲ့ PE များ စိစစ်မှတ်တမ်းတင်ရန်အတွက် အရေးယူ ဆောင်ရွက်လျက်ရှိပါသည်။

၅။ သို့ဖြစ်ပါ၍ PE အဖြစ် မှတ်ပုံတင်ခွင့်ပြုရန် လျှောက်ထားရေးကိစ္စ လွယ်ကူရှင်းလင်းစေရန်အတွက် ယခုကဲ့သို့ PE အဖြစ် မှတ်ပုံတင်နိုင်ရန်အတွက် ဆောင်ရွက်ရန် လိုအပ်သောအချက်များကို ပြုစုထုတ်ဝေခြင်းဖြစ်ပါသည်။

မြန်မာနိုင်ငံအင်ဂျင်နီယာစိစစ်ရေးဘုတ်အဖွဲ့
Myanmar Board of Engineers

Professional Engineer (PE) အဖြစ် မှတ်ပုံတင်နိုင်ရန်အတွက် ဆောင်ရွက်ရန် လိုအပ်သော အချက်များ

၁။ မြန်မာနိုင်ငံအင်ဂျင်နီယာဝိစစ်ရေးဘုတ်အဖွဲ့တွင် PE အဖြစ် မှတ်ပုံတင်ရန်လျှောက်ထားသော သတ်မှတ်ထားသည့် အရည်အသွေးပြည့်မှီသောအင်ဂျင်နီယာများ ဆောင်ရွက်ရန်လိုအပ်ချက်အကျဉ်းချုပ်ကို နောက်ဆက်တွဲ (က)ဖြင့် ဖော်ပြထားပါသည်။ အဓိကလိုအပ်ချက်များမှာ အောက်ပါအတိုင်းဖြစ်ပါသည် -

(က) Professional Development Program (PDP) သင်တန်းများတက်ရောက်ခြင်း။

(ခ) Continuing Professional Development (CPD) အတွက်လိုအပ်သော Seminar, Workshop များ တက်ရောက်ခြင်း နှင့် အခြားလိုအပ်ချက်များဆောင်ရွက်ခြင်း။

(ဂ) Professional Assessment ဝင်ယူခြင်း။

Professional Development Program (PDP)

၂။ Professional Development Program (PDP) သင်တန်းများတွင် အောက်ဖော်ပြပါဘာသာရပ်များ ဆွေးနွေးပို့ချသွားမည် ဖြစ်ပါသည် -

(က) Engineering Management

(ခ) Safety

(ဂ) Ethics

(ဃ) Fundamentals of Engineering

(င) Rules, Regulations, Standards and Specification

(စ) Professional Topics

၃။ PDP သင်တန်းများ၏ ရည်ရွယ်ချက်မှာ အင်ဂျင်နီယာတစ်ဦးအနေဖြင့် လုပ်ငန်းဆောင်ရွက်ရာတွင် အဖြေခံသိသင့်သိထိုက်သည်များကို လေ့လာသိရှိထားရန်ဖြစ်ပါသည်။ လျှောက်ထားသူ၏အတွေ့အကြုံ လုပ်သက်အရ အင်ဂျင်နီယာတွဲနှစ်ဦး လုပ်ငန်းအတွေ့အကြုံ (ဂ)နှစ်မှ (၁၅)နှစ်အတွင်း လျှောက်ထားသူများ အနေဖြင့် PDP သင်တန်း Report တင်ပြကာ၊ ရေးဖြေတမေးပွဲဖြေဆိုရမည်ဖြစ်ပြီး၊ အင်ဂျင်နီယာတွဲနှစ်ဦး လုပ်ငန်းအတွေ့အကြုံ (၁၅)နှစ်နှင့်အထက်လျှောက်ထားသူများအနေဖြင့် တက်ရောက်ပြီးစီးသည့် PDP သင်တန်းမှတ်တမ်း ထားရှိရပါမည်။ ရေးဖြေတမေးပွဲဖြေဆိုရန်မလိုဘဲ PDP သင်တန်း Report တင်ပြရပါမည်။ တက်ရောက်ပြီးစီးသည့် PDP သင်တန်းမှတ်တမ်း (PDP Record Sheet) ကို နောက်ဆက်တွဲ (ခ) ဖြင့်ဖော်ပြထားပါသည်။ ၂၀၁၅ခုနှစ်နှင့် နောက်ပိုင်းတွင် PE စတင်လျှောက်ထားသူအားလုံး PDP စာမေးပွဲဖြေဆိုရမည် ဖြစ်ပါသည်။

၄။ လျှောက်ထားသူများအနေဖြင့် သတ်မှတ်ထားသည့်ဘာသာရပ်အလိုက်တက်ရောက် 'နာရီ' ပြည့်မှီအောင်သင်တန်းများ တက်ရောက်ပြဆိုရပါမည်။ မြန်မာနိုင်ငံအင်ဂျင်နီယာဝိစစ်ရေးဘုတ်အဖွဲ့မှ သင်တန်းဌာနဝင်မည်ဘာသာရပ်၊ နေ့ရက်နှင့်အချိန်ကို အစီအစဉ်ကြေငြာပေးမည်ဖြစ်ပါသည်။

Continuing Professional Development (CPD)

၅။ Continuing Professional Development (CPD) စနစ်မှာ Professional Engineer တစ်ဦးအနေဖြင့် ၎င်း တစ်သက်တာအင်ဂျင်နီယာလုပ်ငန်းများဆောင်ရွက်ရာတွင် အတွေ့အကြုံ ဗဟုသုတများပြည့်စုံကြွယ်ဝရေး၊ အင်ဂျင်နီယာပညာတိုးတက်နေရေးနှင့် အဆက်မပြတ်သွားရေး စသည်ဖြင့် အင်ဂျင်နီယာတစ်ဦးလုပ်ငန်းဆောင်ရွက်ရာတွင် ပိုမိုထိရောက်အောင်မြင်ရေး အတွက်ကဏ္ဍအရပ်ရပ်အင်ဂျင်နီယာအဖွဲ့အစည်းများအနေဖြင့် လိုက်နာဆောင်ရွက်လျှက်ရှိသောစနစ်တစ်ရပ်ဖြစ်ပါသည်။

၆။ CPD နာမိုကို အောက်အော်ပြပါလုပ်ငန်းများမှ ရရှိနိုင်ပါသည် -

(က) Formal Education and Training Activities
(ခ) Informal Learning Activities – on job learning
(ဂ) Informal Learning Activities – private study
(ဃ) Conference and Meeting
(င) Presentation and Papers
(စ) Service Activities
(ဆ) Industry Involvement (for academician)

၇။ Service Activities များမှာ Professional အသင်းအဖွဲ့များတွင်ပါဝင်ဆောင်ရွက်ခြင်း၊ အင်ဂျင်နီယာညွှန်ကြားရေးအများအကျိုးပြုလုပ်ငန်း ဆောင်ရွက်ခြင်းများဖြစ်ပါသည်။ Industry Involvement (for academician) မှာ အင်ဂျင်နီယာညွှန်ကြားရေးအပိုင်းတွင် ဆောင်ရွက်နေသောအင်ဂျင်နီယာများအနေဖြင့်၊ ပြင်ပအင်ဂျင်နီယာလုပ်ငန်းများတွင် လက်တွေ့ပါဝင်ဆောင်ရွက်နေမှုကို ဖော်ပြပေးရန်ဖြစ်ပါသည်။ CPD နှင့်ပတ်သက်၍ လျှောက်ထားသူမှဖြည့်စွက်ရမည့်ပုံစံကို နောက်ဆက်တွဲ (ဂ) ဖြင့် ဖော်ပြထားပါသည်။

Professional Assessment

၈။ Professional Engineer တစ်ဦးအဖြစ်မှတ်ပုံတင်ရန်အတွက် Professional Assessment အစန်းကဏ္ဍသည် အထူးပင် အရေးကြီးပြီး အောက်ဖော်ပြပါများပါဝင်ပါသည် -

(က) Professional Assessment Written Examination
(ခ) Professional Experiences and Competency Report
(ဂ) Professional Presentation on Projects and Achievements.
(ဃ) Professional Interview

၉။ Professional Assessment Written Examination ကိုလုပ်သက် ၁၅နှစ်နှင့်အထက် ဝိဇ္ဇာအင်ဂျင်နီယာများ အနေဖြင့် ဖြေဆိုရန်ဖြစ်ပါသည်။ သို့သော် အခြားအဖွဲ့က (၃)ကြိမ်သော Report, Presentation, နှင့် Interview များ၏ လိုအပ်ချက်များကို ဂုဏ်ထူးဆောင်ရွက်ရမည်ဖြစ်ပါသည်။ ၂၀၁၅ခုနှစ်နှင့် နောက်ပိုင်းတွင် PE ဝတ်လျှောက်ထားသူအားလုံး PDP တာမေးမှဖြေဆိုရမည် ဖြစ်ပါသည်။

၁၀။ Professional Assessment လုပ်ငန်းကို ဝိဇ္ဇာအင်ဂျင်နီယာများ ပြန်ဟန်ဆောင်အင်ဂျင်နီယာစီစစ်ရေးအဖွဲ့ Professional Assessment Group (PAG) လက်ရှိကွန်းကျင်အင်ဂျင်နီယာများပါဝင်သော ဘာသာရပ်အလိုက်စီစစ်ရေးအဖွဲ့များမှ ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

၁၁။ **Professional Assessment Written Examination (PAWE)** - PAWE တာမေးမှသည် အင်ဂျင်နီယာတစ်ဦး၏ အင်ဂျင်နီယာညွှန်ကြားရေးနှင့် ပတ်သက်သည့်အခြေခံအင်ဂျင်နီယာညွှန်ကြားရေးများလက်တွေ့ဆောင်ရွက်ရာတွင် ကိုက်ညီသော နည်းနစ်များ၊ သက်ဆိုင်ရာတာသာရပ်အလိုက်ဖြေဆိုရမည့် စာမေးမှဖြစ်ပါသည်။ လေ့လာဖြေဆိုရမည့် ဘာသာရပ်အလိုက် ခေါင်းစဉ်များနှင့် မှီငြပ်းစာတို့ကို လေ့လာမှုအတွက် စာတမ်းစာရင်းကို နောက်ဆက်တွဲ (ဃ) ဖြင့်ဖော်ပြထားပါသည်။ အခြားဒေသ ကွန်ယက်ကွင်းအတွက် လေ့လာမှတ်သားစာတို့ရှာထားရန်ကိုလည်း တိုက်တွန်းအပ်ပါသည်။

Professional Experiences and Competency Report (PECR)

၁၂။ PECR သည် Professional Engineer တစ်ဦးဖြစ်မြောက်ရေးအတွက် အထူးပင်အရေးကြီးပါသည်။ Profession Competency နှင့်ပတ်သက်၍ အောက်ဖော်ပြပါအချက်များအခြေခံရန်ဖြစ်ပါ၍ Competency Report ပြုစုရာတွင် အဆိုပါအချက်များကို အလေးထား၍ ဖိဒ်ဆောင်ရွက်ခဲ့သည့်လုပ်ငန်းအတွေ့အကြုံများကို ဆက်စပ်ဖော်ပြရေးသားရန်ဖြစ်ပါသည်-

(က) Apply Engineering Knowledge, Methods and Techniques.

(ခ) Use of engineering technology, tools and equipment

(ဂ) Safeguard public safety

(ဃ) Recognize the impacts of engineering on the environment, economy and society

(င) Manage engineering activities

(စ) Communicate engineering information

(ဆ) Work Collaboratively

(ဇ) Maintain and enhance engineering skills and knowledge

၁၃။ Professional Experience and Competency နှင့်ပတ်သက်၍ ဧရိယာဝင်တစ်ခုခုနှင့်အလိုက်အသေးစိတ်ရှင်းလင်းဖော်ပြထားရှိချက်ကို နောက်ဆက်တွဲ(c) ဖြင့်ဖော်ပြထားပါသည်။ ဖိဒ်ဆောင်ရွက်ခဲ့သည့်လုပ်ငန်းများတွင် ဖိဒ်အိုကျွမ်းကျွမ်မှုကို ဆက်စပ်ဖော်ပြနိုင်သောလုပ်ငန်းရပ်ကို အကြွေးဝင်သောဧရိယာများကိုအခြေခံ၍ မြန်လည်သုံးသပ်ပြီး ဖိဒ်အိတတ်ကျွမ်းမှုနှင့် ဆောင်ရွက်ခဲ့မှုကို ဖော်ပြပေးရန်ဖြစ်ပါသည်။

၁၄။ Professional Experiences and Competency Report မှာ ဖိဒ်ဆောင်ရွက်ချက်များကို ပထမဖော်ပြပြီး အခြေခံအချက် (၈)ချက်ဖြင့် မြန်လည်သုံးသပ်ဖော်ပြရန်ဖြစ်ပါ၍ စတင်ရေးသားဖော်ပြရန်အချက်အလက်များမြန်လည်ရှာဖွေခြင်း၊ ဖိဒ်ကိုယ်ကိုဖိဒ် ဝေဖန်သုံးသပ်ရန် လိုအပ်ခြင်းကြောင့် ကနဦးတွင် အခက်အခဲရှိခဲ့သော်လည်း ယခုကဲ့သို့ဆောင်ရွက်မှုကို နိုင်ငံရပ်ခြား Professional Engineer စီစဉ်မှုများတွင် လက်ခံကျင့်သုံးခဲ့ပါ၍ Professional Engineer လျှောက်ထားသူများအနေဖြင့် ကြိုတင် ဆောင်ရွက်ပေးရန်ဖြစ်ပါသည်။

၁၅။ Professional Experiences and Competency Report ရေးသားရာတွင် အောက်ဖော်ပြပါ Format ကို အခြေခံ၍ ရေးသားရန်အကြံပြုပါသည်။ စာလုံးရေ ၂၀၀၀ မှ ၃၀၀၀ အထိသာရေးသားပြီး ဝိတ္တူ(၄) တော်ပေးရန်ဖြစ်ပါသည်။

Section (1) Introduction

Section (2) Work experiences in brief and highlight the major important projects.

Section (3-10) Using each Competence Element / Performance Indicators as heading, describe the problems and activities that you have addressed or been involved in to demonstrate your attainments under each heading.

၁၆။ Professional Experiences and Competency Report အား အင်္ဂလိပ်ဘာသာဖြင့်ရေးသားပြုစုရန် အကြံပြုပါသည်။ မြန်မာဘာသာဖြင့်ရေးသားလိုပါကလည်း မြန်မာဘာသာဖြင့်ရေးသားပြုစုခြင်းကို လက်ခံစိစစ်ပေးသွားမည်ဖြစ်ပါသည်။ အထက်အပိုဒ် (က)တွင် အကြံပြုဖော်ပြထားသည့်အပိုဒ်ခွဲများကို အနီးစပ်ဆုံးအဖြစ်ပြုရေးသားပေးရန်ဖြစ်ပါသည်။ သတ်မှတ်ဧရိယာများမှာ ကျွမ်းကျင်မှုတိုင်းတာရန်အခြေခံအချက်များဖြစ်ပါသည်။

၁၇။ **Professional Presentation on Projects and Achievements(PPPA)** - ယခုစစ်မှုလုပ်ငန်းအတွက် Professional Engineers မှတ်ပုံတင်လျှောက်ထားသူအနေဖြင့် မိမိဆောင်ရွက်လုပ်ကိုင်ခဲ့သည့်လုပ်ငန်းများထဲမှ မိမိ၏ကျွမ်းကျင်မှုကို အခြေခံ၍ တာဝန်ယူဆောင်ရွက်ခဲ့သောလုပ်ငန်းတစ်ခု (သို့မဟုတ်) နှစ်ခုကိုပြုစုတင်ပြဆွေးနွေးပေးရန် ဖြစ်ပါသည်။ အဆိုပါ ဆွေးနွေးတင်ပြမှုအတွက် Report တစ်စောင်နှင့် လိုအပ်သော အခြေခံဒီဇိုင်းပုံစံများ၊ ဆောင်ရွက်ချက်မှတ်တမ်းမှတ်ရာများ တင်ပြရန်လိုအပ်ပါသည်။ မိမိအနေဖြင့်တင်ပြသည့် လုပ်ငန်းတွင် မည်သည့်အနေအထားတာဝန်ယူခဲ့သည်ကို ရှင်းလင်းတင်ပြပြီး ဆောင်ရွက်ခဲ့သည့်အချိန်က မည်သည့်အင်ဂျင်နီယာ ပညာရပ်များကို အခြေခံ၍ လုပ်ငန်းပြီးမြောက်အောင်ဆောင်ရွက်ခဲ့ကြောင်း ရှင်းလင်းတင်ပြရန်ဖြစ်ပါသည်။ တင်ပြချိန်အနေဖြင့် အများဆုံး(၂၀)မိနစ်ခန့်နှင့် အပြီးတင်ပြပေးရန်ဖြစ်ပါသည်။ မေးမြန်း ဆွေးနွေးချိန်(၁၀)မိနစ်ခန့် ဖြစ်ပါသည်။

၁၈။ **Professional Interview(PI)** - လုတွေ့မေးမြန်းဆွေးနွေးခြင်းအား အထက်ဖော်ပြပါ။ PDP သင်တန်းများမှရရှိသည့် ဓာတ်သုတများ၊ လုပ်ငန်းဆောင်ရွက်စဉ် အတွေ့အကြုံများ၊ PE လျှောက်ထားသူ၏ ကျွမ်းကျင်မှုပိုင်းဆိုင်ရာများကို မြှင့်သုံးသပ်နိုင်ရန် ဆောင်ရွက်ခြင်းဖြစ်ပါသည်။ အခြေခံမေးမြန်းဆွေးနွေးမည့် ခေါင်းစဉ်များကိုနောက်ဆက်တွဲ(ခ)ဖြင့် ဖော်ပြထားပါသည်။ PE တစ်ဦးအနေဖြင့် ကျွမ်းကျင်မှုပိုင်းဆိုင်ရာ လိုအပ်ချက်များပြည့်မှီရေးအတွက် အခြေခံလိုအပ်ချက်များဖြစ်ပါသည်။ Professional Assessment Written Examination အတွက် ဖော်ပြထားသည့် နောက်ဆက်တွဲ (ဃ)ပါ မိမိနှင့်သက်ဆိုင်သည့် ဘာသာရပ်များအား လေ့လာမှုပြုထားရန် တိုက်တွန်းအပ်ပါသည်။ **PI** အချိန် (၃၀)မိနစ်ခန့် ကြာမြင့်မည်ဖြစ်ပါသည်။

၁၉။ မြန်မာနိုင်ငံတွင်ယခုတင်အကောင်အထည်ဖော်သည့် Professional Engineer System အား ကမ္ဘာ့နိုင်ငံအရပ်ရပ်ရှိ စနစ်များ၊ အိမ်နီးချင်းနိုင်ငံများ၏စနစ်များကိုအခြေခံ၍ အခြားနိုင်ငံရှိစနစ်များထက် နိမ့်ကျမှုမရှိရန်စိစဉ်ထားရှိထားပါ၍ Professional Engineers မှတ်ပုံတင်လျှောက်ထားသည့် အင်ဂျင်နီယာများမှလည်း ဝိုင်းဝန်းကြိုးစားဆောင်ရွက်ရန် မေတ္တာရပ်ခံပါသည်။

နောက်ဆက်တွဲ (က)

MYANMAR BOARD OF ENGINEERS

Professional Engineer Assessment (2012)

Sr No.	Requirements for PE Registration	PDP Hours requirements and other requirements			
		Experiences			
		7 years to Less than 10 Years	10 years	15 years	20 years
	B.E Graduation Year	2005 and before 2005	2002 and before 2002	1997 and before 1997	1992 and before 1992
A	Professional Development Program (PDP)				
	Total PDP Hr Requirement	40	30	20	15
1	Engineering Management	6	4	4	2
2	Safety	6	4	4	2
3	Ethics	4	2	2	2
4	Fundamentals of Engineering	8	8	4	3
5	Acts, Rules and Regulations	4	4	4	4
6	Topics related to Engineering Discipline	12	8	2	2
7	Report on understanding of the above topics			Report	Report
8	Examination on above topics	Exam	Exam		
B	Continuing Professional Development				
1	Report on CPD activities of last three years (Average hrs. per year)	30	30	25	20
C	Professional Assessment				
1	Report on Professional Experiences & Competency	Report	Report	Report	Report
2	Examination on Professional Topics	Exam	Exam		
3	Professional Interview	PI	PI	PI	PI
4	Presentation on Professional Experiences	Presentation	Presentation	Presentation	Presentation
5	Discussion, comment and question on Presentation	DCQ	DCQ	DCQ	DCQ

MYANMAR BOARD OF ENGINEERS

PROFESSIONAL DEVELOPMENT PROGRAMS

PDP RECORD SHEET

NAME _____

Sr.No.	Date/Time	PDP Topic	PDP Provider	Hours	Signature of Provider
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Total PDP Hours

1. Engineering Management (EM) -
2. Safety -
3. Ethics -
4. Fundamentals of Engineering (FE) -
5. Acts, Rules & Regulations -
6. Professional Topics (PT) -

Submitted By

Signature -

Name -

Address -

Email -

Phone No -

MYANMAR BOARD OF ENGINEERS

CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS

CPD RECORD SHEET No.1

Ref	Date	CPD activity/ topic/ provider	Time			
			Actual	Weight Factor	Weighted hours	allowable weighted hours
1. Formal Education and Training Activities (time weighted factor = 2)						
1				2		
2				2		
3				2		
4				2		
5				2		
6				2		
7				2		
8				2		
9				2		
10				2		
Total Weighted Hours =						
Total Allowable Weighted Hours (No limit) =						
2a. Informal Learning Activities – on job learning (time weighted factors = 1)						
1				1		
2				1		
3				1		
4				1		
5				1		
6				1		
7				1		
8				1		
9				1		
10				1		
Total Weighted Hours =						
Total Allowable Weighted Hours (Maximum 20 hours per year) =						
2b. Informal Learning Activities – private study (time weighted factors = 0.5)						
1				0.5		
2				0.5		
3				0.5		
4				0.5		
5				0.5		
6				0.5		
7				0.5		
8				0.5		
9				0.5		
10				0.5		
Total Weighted Hours =						
Total Allowable Weighted Hours (Maximum 10 hours per year) =						

MYANMAR BOARD OF ENGINEERS

CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS

CPD RECORD SHEET No.2

Ref	Date	CPD activity/ topic/ provider	Time (hours) Actual	Weight Factor	Weighted hours	allowable weighted hours
3. Conference and Meeting (time weighted factor = 1)						
1				1		
2				1		
3				1		
4				1		
5				1		
6				1		
7				1		
8				1		
9				1		
10				1		
Total Weighted Hours =						
Total Allowable Weighted Hours (No limit) =						
4. Presentation and Papers (time weighted factors = 10)						
1				10		
2				10		
3				10		
4				10		
5				10		
6				10		
7				10		
8				10		
9				10		
10				10		
Total Weighted Hours =						
Total Allowable Weighted Hours (Maximum 30 hours) =						
5. Service Activities (time weighted factor = 1)						
1				1		
2				1		
3				1		
4				1		
5				1		
6				1		
7				1		
8				1		
9				1		
10				1		
Total Weighted Hours =						
Total Allowable Weighted Hours (Maximum 30 hours) =						

MYANMAR BOARD OF ENGINEERS

CONTINUING PROFESSIONAL DEVELOPMENT FOR PROFESSIONAL ENGINEERS

CPD RECORD SHEET No.3

Ref	Date	CPD activity/ topic/ provider	Time (hours)			
			Actual	Weight Factor	Weighted hours	allowable weighted hours
6. Industry Involvement (for academician) (time weighted factor = 1)						
1				1		
2				1		
3				1		
4				1		
5				1		
6				1		
7				1		
8				1		
9				1		
10						
Total Weighted Hours =						
Total Allowable Weighted Hours (Maximum 30 hours) =						

Every applicant for Professional Engineer must submit his CPD records to Myanmar Board of Engineers. The Board will make random check on the submission.

Average CPD hours must not be less than 20/ 25/ 30 per year over a three year period, according to experiences.

ALLOWABLE WEIGHTED CPD HOURS WILL BE FILLED BY MBE

CPD RECORD SHEET SUBMITTED BY

SIGNATURE _____

NAME _____

NATIONAL REGISTRATION NO; _____

ADDRESS _____

_____

EMAIL _____

PHONE _____

DATE _____

ရောက်ဆက်တွဲ (၀၁)

Scope (Building Construction PE)

(A) Earthwork Construction & Layout
- Excavation & Layout (cut & fill)
- Borrow pit volumes
- Site layout & control

(B) Estimating Quantities & Costs
- Builder's estimate & Builder's quantity
- Cost Estimating
- Cost Controlling

(C) Scheduling
- Construction sequencing
- Resource scheduling
- Phargraph & CPM analysis
- Engineering management

(D) Design & Drawings
- Basic design principles
- Shop drawings

(E) Materials Quality Control & Production
- Materials specilications & testings (Cement, Coarse and fine aggregate, Water, Construction chemicals, Structural steel, Timber etc,)
- Welding & bolting testing
- Quality control process (QA/ QC)
- Concrete (Plain, Reinforced, Prestressed, Post tensioned, Fiber reinforced concrete, Ferrocement, High performance concrete,Light weight concrete)
- Concrete mix design
- Concrete maturity & early strength evaluation

(F) Temporary Structures
- Construction Load
- Formwork
- False work & Scaffolding
- Shoring & reshoring
- Bracing
- Anchorage

(G) Geotechnical & Foundation Engineering
- Types of foundation
- Soil classification
- Boring log interpretation (e.g soil profile etc;)
- Pressure distribution
- Lateral earth pressure
- Consolidation
- Compaction
- Slope Stability
- Slabs on grade
- Bearing Capacity
- Settlement
- Retaining Walls (gravity walls, RC walls, cantilever walls etc;)
- Braced & anchored excavation

(H) Structural Engineering
- Loadings (dead loads, live loads, E.Q Loads, wind loads, snow loads, construction loads, load paths, etc;)
- Shear force diagram
- Bending moment diagram
- Flexure, Shear, Tension, Compression, Torsion
- Combined stresses
- Deflection

(I) Construction Equipment
- Design of equipment fleet operation & productivity
- Design of rigging & conveying system

(J) Safe Demolition System for Constructed Facilities

(K) Engineering Ethics

(L) Occupational Safety and Health

(M) Code of Practice, Rules & Regulations

(N) Computer Skill

(Building Construction PE)

REFERENCES

1. Handbook of Rigging by Joseph A.MacDonald
2. Construction Management (CM 188)
3. Construction Methods and Planning by J.R.ILLINGWORTH
4. All in one civil Engineering PE.Breadth and Depth

Scope (Road PE)

Road

(1) Basic Principles of Road Design.
  (a) Road Geometric Design.
    (1) Flexible pavements.
    (2) Rigid pavements.

(2) Road Structures Design.
  (1) Flexible pavements.
  (2) Rigid pavements.

(3) Standard Technical Specifications for road constructions.

(4) Standard Specification for Road Maintenances.

(5) Road Maintenance Manual.

(6) Rules, Regulations and Acts.
  - Road acts.
  - Toll road acts.
  - Road maintenance fund act.
  - Road safety regulations.

(7) Pavement Condition Assessment.
  - Surface evaluation and rating.
  - Ride quality assessment.
  - Multi-year budgeting for pavement rehabilitations and reconstructions.
  - Priority selecting and financing for maintenance works.

(8) Construction.
  (a) Earth works.
    - Requirements for excavation of cutting.
    - Requirements for embankment.
    - Requirements for embankment construction.
    - Borrow excavation and compaction for subgrades.
    - Mechanical and chemical stabilizations.
  (b) Sub-base and Base.
    - Granular base.
    - Gravel/ soil aggregate base and surface courses.
    - Cement treated soil and crushed stone subbase and base.
    - Graded crushed stone subbase and base.
    - Water bound macadam subbase and base.
    - Dry bound macadam subbase and base.

(c) Surface courses.
- Bituminous macadam (penetration method) surface course.
- Asphalt concrete pavement.
- Bituminous premix surface course.
- Cold mixed asphalt.
- Portlant cement concrete pavement (plain and reinforced).
- Roller compacted concrete pavement.
- Recycling of pavement.

(d) Drain and Drainage system.

(e) Road Signs and Safety measure.
- Road furnitures.
- Road safety audit.
- Road signs, Road markings, signals.
- Improvement hazardous location (Black spot).

(f) Environment impect.

(9) Maintenance Works.
- Gravel roads.
- Bituminous pavements.
- Asphalt concrete pavements.
- Concrete pavements.
- Drains and drainage structures.
- Road signs and safety measures.

(10) Quality Control and Quality Assurance.

(11) Ethics.

(12) Occupational Safety and Health.

(13) Engineering Management.

(Road PE)

REFERENCES

1.All in one civil engineering PE (Exam Guide)

Breadth and Depth

by Indranil Goswami, Ph.D, PE, Mc Graw Hill

2.Basic Principles of Highway Design

(a) "AASHTO Guide for Design of Pavement Structures: 1993". Published by AASHTO.

(b) "Pavement Design and Selection". 2012 Edition, Feb 9, 2012): Michigan Department of Transporation (MDOT)

(c) Implementation of the AASHTO Pavement Design Procedures into Multi-pave" by Abiy Bekele, Division of Highway and Railway Engineering, Department of Civil and Architectural Engineering, Royal Institute of Technology, Stockholm 2011.

(d) "Pavement Design Manual, Supplement to Part 2: Pavement Structural Design" of Austroads" issued by Queens land Department of Main Roads.

(e) Mechanistic - Empirical Pavement Design Guide Implementation" submitted to the South Carolina Department of Transporation and the Federal Highway Administration.

(f) "Concrete Pavement Design, Costruction and Performance" by Norbert Delatta.

(g) "လမ်းအကြောင်းသိကောင်းစရာ" ပြည်သူ့ဆောက်လုပ်ရေးလုပ်ငန်း လမ်းသုတေသန

3. Road Geometrical Standards

(a) Geometric Design Standard (ပြည်သူ့ဆောက်လုပ်ရေးလုပ်ငန်း)

(b) Road Note 31 - Transport + Road Research Laboratory UK.

(c) Washington State Department of Transport Design Manual

(d) A policy on Highway Geometric Design AASHTO.

4. Standard Technical Specifications for Road Construction

(a) Standard Specifications for construction of Roads and Bridges on federal Highway projects: F P-96, 1996 by US DOT, FHA.

(b) "Standard Technical Specifications for Roads, Bridge and Municipal Construction 2010:M41-10" by Washington State DOT-

(c) "Standard Technical Specifications for Road and Bridge Works" of Public Works", Ministry of Construction: May 2012.

5. Standard Specification for Road Maintenance

- "Maintenance Standards for Road and Bridge works" of Public Works, Ministry of Construction, February 2012.

Scope (Structure PE)

(A) Strength of Materials.
- Sign Convention for Stresses.
- Centroid of an Area by Integration.
- Centroid of a Compound Area_Weighted Average.
- Various Section Properties.
- Bending Stress.
- Combined Axial and Bending Stress.
- Shear Stress Due to Transverse Load.
- Shear Stress Due to Torsion_Circular Sections.
- Shear Stress Due to Torsion_Rectangular Sections.
- Shear Stress Due to Torsion_Thin-Walled Sections.
- Stress in Pressure Vessels.
  - Thin-Walled Pressure Vessel.
- Moh's Circle: Normal ( ) and Shear Stress ( ) Combination

(B) Statically Determinate Structures
- Vectors
- Dot Product
- Cross Product
- Equivalent Force System
- Analysis of Trusses
- Truss Member Forces-Method of Joints
- Truss Member Forces-Method of Sections
- Identification of Zero-Force Members
- Truss Deflection-Method of Virtual Work
- Cables under Point Loads
- Cables under Uniformly Distributed Load
  - Load Distributed Uniformly along Horizontal Axis (e.g., Bridge Deck)
  - Load Distributed Uniformly along Cable Length (e.g., Self Weight)
- Shear Force and Bending Moment
- Beam Deflection-the Elastic Curve
- Direct Integration Method
- Moment-Area Method
- Conjugate Beam Method

- Unit Load Method
- Beam Deflection Equations
- Influence Lines
  - Principle of Müller-Breslau
  - Influence Line for Vertical Reaction at A
  - Influence Line for Reaction Moment at A
  - Influence Line for Shear at C
  - Influence Line for Bending Moment at C
- Shear at Midspan of Uniformly Loaded Beams
- Influence of a Series of Concentrated Loads
  - Absolute Maximum Shear
  - Absolute Maximum Bending Moment
- Calculating Effect of Concentrated and Distributed Loads

(C) Introduction to Indeterminate Structures
- Stability and Determinacy
- Determinate versus Indeterminate Structures
- The General Force Method
- Force Method Illustration
- Castigliano's Method
  - Castigliano's Second Theorem
- Castigliano's Method Applied to Trusses
- Castigliano's Method Applied to Beams
- Displacement Method
- Moment-Distribution Method
- The Slope-Deflection Method
- Using Results from Moment-Distribution or Slope-Deflection Methods
- Fixed-End Moments

(D) Concrete Fundamentals
- Absolute Volume Method
- ACI Provisions
- Reinforcement
- Strength Design Approach
- Load Combinations (ASCE-7)

(E) Reinforced Concrete Beams
- General

- Design Moments at Critical Locations.
- Cracked Section Characteristics.
  - Effective Moment of Inertia.
  - Clear Cover Guidelines.
- ACI Limits on Flexural Reinforcement.
- Spacing Guidelines
- Flexural Capacity of Singly Reinforced Concrete Beams.
- Design Problems.
- Doubly Reinforced Rectangular Section.
  - Compression Steel Yielded.
- Singly Reinforced T-Beams.
  - Effective Flange Width.
  - Flexural Capacity of Singly Reinforced T-Beams.
  - Rectangular Beam Behavior.
  - True T-Bean Behabvior.
- Design of Reinforced Concrete Beams for Shear.
- Shear at Midspan of Uniformly Loaded Beams.

(F) Reinforced Concrete Slabs.
- General.
- One-Way Reinforced Concrete Slabs.
- Minimum Slab Thickness.
- Temperature and Shrinkage Reinforcement.
- Two-Way Reinforced Concrete Slabs.
  - Total Static Moment in Slab Panel.

(G) Reinforced Concrete Columns
- Guidelines on Longitudinal Reinforcement.
- Short versus Long Columns.
- Axial Load Capacity of Short RC Columns.
- Column Interaction Diagrams.
- Long Columns
  - Concentrically Loaded Long Columns (e=0)
  - Eccentrically Loaded Columns in Nonsway Frames.
  - Eccentrically Loaded Columns in Sway Frames.

(H) Steel Tension Members.
- Load and Resistance Factor Design (LRFD)

- Analysis and Design of Tension Members.
- Nominal Strength.
- Net Area in Tension.
- Net Area for Staggered Bolt Lines.
- Effective Net Area.
    - Shear Lag Coefficient.
- Aisc Load Tables.
- Block Shear.
- Pin-Connected Tension Members.

(I) Steel Compression Members.

- Stability of Axially Loaded Columns_Euler Buckling.
- Critical Buckling Stress for Steel Columns.
    - Elastic Buckling.
    - Inelastic Buckling.
- Braced Columns.
- Effective Length for Columns in a Frame.
- Column with Slender Elements.
    - Elastic Buckling.
    - Inelastic Buckling.
- Single-Angle Compression Elements.
- Built-Up Compression Members.

(J) Steel Beams_Design for Flexure.

- General Flexure Theory.
- Progressive Increase of Flexural Stresses.
- Elastic Section Modulus.
- Plastic Section Modulus.
- Design of Steel Beams_AISC Specifications.
    - Nominal Moment Capacity.
    - Failure by Reaching Fully Plastic State.
    - Inelastic Lateral Torsional Buckling (LTB).
    - Elastic Lateral Torsional Buckling. (LTB).
- Bending Coefficient C_b
- Beam Design Using Z_x Tables.
- Beam Design Using Charts.
- Compactness Criteria.

- Flexural Strength of Noncompact Sections.
  - Flange Local Buckling (FLB)
  - Lateral Torsional Buckling (LTB)
- Design for Shear.
- Floor Framing Systems.

(K) Bolted and Welded Connections.

- General
- Snug-Tight versus Slip-Critical Connections
- Bearing Type Connections
  - Bearing Strength of Bolts.
  - Shear Strength of Bolts.
- Slip-Critical Connections.
- Bolt Group Subject to Shear and Torsion.
- Bolts Subject to Shear and Tension.
- Fillet-Welded Joints.
- Fillet Weld Features.
- Strength of a Fillet Weld.
- Second Moments of Weld Runs.

(L) Timber Design

- Bending Stress.
- Shear Stress.
- Modulus of Elasticity.
- Stress Modification Factors.
- Design of Timber Columns.
  - Buckling Limit State.
  - Crushing Limit State.
  - Ylinen Column Equation.
- Section Properties of Beams and Joists.
- Section Properties of Planks.
- Section Properties of Decking.

Reference Textbook

1- ALL-IN-ONE Civil Engineering P.E. Breadth and Depth-Exam Guide, INDRANIL GOSWAMI

2-Uniform Building Code 1997

3-International Building Code 2006

4-Building Code Requirements for Structural Concrete -ACI-318

5-ASCE- Minimum Design Loads for Buildings and other Structures -ASCE 07

6- Fundamentals of Engineering Review Books

SCOPE (Geotechnical PE)

(A) Phase Relationships for Soils
- Soil as a Three-Phase System.
- Fundamental Definitions.
- Shrinkage and Swell.

(B) Soil Sampling and Testing.
-Guidelines for Subsurface Sampling
- Structure Foundation.
- Retaining Structures.
- Ground Water
- Interpretation of Boring Logs.
- Effective Stress.
- Soil Consistency.
- Atterberg Limit Tests.
- Liquid Limit Test (ASTM D-4318)
- Plastic Limit Test (ASTM D-4318)
- Standard Penetration Test (SPT)
-Corrections to Field N Value.
- Correlation between N Value and Bearing Capacity.
- Relative Density.
- Direct Shear Test.
- Unconfined Compression Test.
- Compaction.
- Triaxial Test Fundamentals.

(C) Soil Classification
- Sieve Sizes.
- USDA Textural Classification of Soils
- Partice Size Distribution Curves
- Hydrometer Analysis
- Unified Soil Classification System (USCS)
- AASHTO Soil Classificaion
Less Than or Equal to 35 % Passing No.200
Sieve- Predominantly Granular
More Than 35% Passing No. 200 Sieve-Predominantly
Fine Grain
- Group Index (GI)

(D) Vertical Stress Increse at Depth
- Approximate Methods
- Boussinesq Model for Stress under Uniformly Loaded Area
- Newmark's Chart for Graphical solution of Boussinesq's Equation
  Boussinesq's Equation
  Stress Increase Duw to a point Load
    Boussinesq's Theory
    Westergaard's Theory
  Stress Increase Due to a Line Load
  Stress Increase Due to a Strip Load
  Stress Increase Due to Uniformly Loaded Circular Footing
  Load on Buried Pipes
    Deflection of Flexible Pipes
    Modified Lowa Equation
    Minimum Burial Depth
    Loads on Rigid Pipes
    Indirect Design Method
    Load Factor
    Direct Design Method

(E) Flow through Porous Media
- Groundwater Distribution
- Darcy's Law for Seepage
- Hydraulic Conductivity
- Laboratory Measurement of Hydraulic Conductivity
  - Constant Head Test
  - Falling Head Tes
- Equivalent Hydraulic Conductivity (Layered Soils)
  - Flow Parallel to Soil Layers
  - Flow Transverse to Soil Layers
- Field Measurement of Hydraulic Conductivity
- Flow Nets
- Calculation of Seepage Flow from Flow Nets
- Anisotropic Soils
- Uplift Pressure under Hydraulic Structures
- Expansive Soils
- Gravity Dams
- Aquifers
- Unsteady Well Hydraulics_Theis Method
  - Assumptions for Transient Drawndown Effects
- Groundwater Dewatering.

(F) Shallow Foundations

- General
- Ultimate Bearing Capacity
  - Terzaghi's Bearing Capacity
  - Local Shear Failure
  - General Bearing Capacity Equation
- Shape Correction Factors
- Depth Correction Factors

  For $D_f / B \leq 1$

  For $D_f / B > 1$
- Load Inclination Correction Factors
- Factor of Safety for Bearing Capcacity
- Local Shear Failure
- Dynamic Loads
- Allowable Bearing Pressure in Sand Based on Settlement
- Effect of Water Table on Bearing Capcacity
- Coefficent of Subgrade Reaction
  - Plate Load Test
  - For Sandy Soils
  - For Clays
- Combined Footing
- Combined Footing-Design
- Mat Foundations
- Differential Settlement of Mats
- Compensated Foundations.
- Strap Footing __Design
- Eccentric Load on a Shallow Footing
- Shear in Footings ~ One_Way and Two-Way Shear
- Elastic Settlement under Shallow Foundations

(G) Deep Foundations

- Site Conditions
- Pile Types
- Pile Classification
- Point Bearing Capacity
  - Point Bearing Capacity for Piles in Sand.
  - Point Bearing Capacity for Piles in Clay.
  - Point Bearing Capacity for Piles Resting on a Rock Layer.
- Side Friction Capacity.
- Skin Friction Coefficient.

- Lateral Earth Pressure Coefficient
- Capacity of Pile Groups
- Special Considerations for Steel H-Section Piles
  - H Piles in Sand
  - H Piles in Soft Clay.
  - H Piles in Stiff Clay.
- Pile Groups Subject to Overturning Moment.
- Batter Piles
- Laterally Loaded Long Piles.
- Pullout Resistance
- Negative Skin Friction
- Settlement of Piles
  - Elastic Settlement
  - Settlement Due to Tip Load
  - Settlement Due to Shaft Load
- Elastic Settlement of Pile Groups
- Consolidation Settlement of Pile Groups
- Pile-Driving Formula

(H) Retaining Walls

- Lateral Earth Pressure.
- Wall Movement Necessary to Develop Lateral Pressures.
- Stability and Strength Checks.
- Active Earth Pressure
- Passive Earth Pressure
- Rankine's Theory for Earth Pressure.
- Suitability Number.
- Steps for Evaluating Stability of a Retaining Wall.
- Retaining Wall with Key.
- Horizontal Pressure on Retaining Walls Due to Surface Loads.
  - Point Load on Surface.
  - Line Load on Surface.
- Mechanically Stabilized Eartj (MSE) Walls

(I) Support of Excavation

- Types of Excavation
- Modes of Failure

- Stabilization
- Bottom Heave in a Cut in Clay.
- Typical Plan and Elevation of a Braced Excavation
- Equivalent Pressure Diagrams for Braced Cuts.
  - Sand
  - Soft to Medium Clay
  - Stiff Clay
- Design of Sheet Pile Walls
  - Stability Design for Cantilever Walls
- Ultimate Resistance of Tiebacks
- OSHA Regulations for Excavations

(J) Slope Stability
- Modes of Slope Failure
- Causes of Slope Failure
- Total versus Effective Stress Analysis
- Stability of Infinite Slopes (No Seepage)
- Stability of Infinite Slopes (with Seepage)
- Stability of Finite Slopes
  - Generalized Method of Slices
- Stability of Finite Slope in Clay (Taylor)
- Slope Stabilization Methods
- Recommanded Safety Factors
- Slope Protection

(K) Seismic Topics in Geotechnical Engineering
- Seismic Stress Waves
- Liquefaction
  - Shear Stress in Soil Due to Ground Acceleration
- Beariing Capacity under Dynamic Loading
- Cyclic Stress Ratio
- Glossary of Earthquake Related Terms.

) Earthwork
- General
  - Computation of Earthwork Volumes

- Shrinkage and Bulking
  - Shrinkage
  - Bulking
- Using the Mass Diagram

Reference Textbook

1-ALL-IN-ONE Civil Engineering P.E. Breadth and Depth-Exam Guide. INDRANIL GOSWAMI

2-Foundation Design and Construction , M J Tomlinson

3-Soil Mechanics , R F Craig

4- Fundamentals of Engineering Review Books

5- Foundation Engineering by Joseph E. Bowles

SCOPE Electrical PE (Building Services)

PART I

1. **Basic Electricity**
   - (i) D.C circuit
   - (ii) Alternating(sinusoidal) Voltage and Current
   - (iii) Single Phase A.C Circuit
   - (iv) Phaser Algebra and A.C Circuit
   - (v) Resonance in R-L-C Circuit
2. **Three-phase Circuits and System**
   - (i) Three-phase voltage generation
   - (ii) Phaser diagram
   - (iii) Y-∇ connection
   - (iv) Balanced Three-phase Loads
   - (v) Active, Reactive and Apparent Power
   - (vi) Power Measurements
   - (vii) Power Factor Correction
3. **Magnetism and Magnetic Circuits**
   - (i) Magnetic Field
   - (ii) Magnetic Materials and Magnetization curves
   - (iii) Magnetic Equivalent Circuit
   - (iv) Sinusiodal E xcitation
   - (v) Magnetic losses
4. **A.C/D.C Machines**
   - (i) D.C Machines: operating principle, voltage and torque equations
   - (ii) Three-phase Induction motors; operating principle, equivalent Circuit, torque-speed Characteristics, losses and efficiency.

5. **Transformers**

(i) Ideal Transformer

(ii) Equivalent circuit

(iii) Phasor Diagrams

(iv) Determination of Parameters

(v) Performance Evaluation

(vi) Auto-transformers

(vii) Three-phase Transformers

6. **Active Power and Frequency Control**

(i) Governor Control Systems

(ii) Transmission Losses, penalty factors and loss coefficients

(iii) Automatic Generation Control

(iv) Active power Control Devices

7. **Reactive Power and Frequency Control**

(i) Production and Absorption of Reactive Power

(ii) Methods of Voltage Control

(iii) Reactive Power and Voltage Control Devices

(iv) Application to Transmission and Distribution systems

8. **Electric Power Distribution Systems**

(i) Distribution System Configuration

(ii) Primary and Secondary Distribution

(iii) Ring, Radial and Inner-connected Systems

(iv) Distribution Substation Layout

(v) Planning Criteria and Network Design

(vi) Fault Diagnosis and Restoration of Supply

9. **Building Services Engineering**

(i) Estimation of Power Demand

(ii) L.V Cables and Bus-way Systems

(iii) Conductor Sizing Factors

(iv) Circuit Protective Conductor

(v) Earth Leakage and Touch Voltage

(vi) Inspection and Testing

(vii) Lightning Protection

10. **General Protection Principles**

(i) Basic Protection Principles

(ii) Instrument Transformers

(iii) Coordination of Over-current and Earth Protection for Distribution Systems

(iv) Pilot-wire Differential Protection of Feeder

SCOPE Electrical PE (Building Services)

PART II

1. **Electrical Power Supply**
   - (i) Generation, Transmission, and Distribution
   - (ii) Application of Electricity
   - (iii) Solar Photo-voltaic Systems
   - (iv) Design of Electrical Installations
   - (v) Load Estimation
   - (vi) Power Factor correction
   - (vii) Power Quality and Power system harmonics
   - (viii) Consumer and Substation, Switchboards and Switchgear
   - (ix) Maintenance of Electrical Equipment, Switchgear and Cables
   - (x) Design of Energy Efficiency and Sustainability
2. **Lighting Requirement for Workplace, Indoor, and Outdoor**
   - (i) Visual Needs for Safety and Security
   - (ii) Determine the Lighting Requirements for Indoor and Outdoor Workplaces
3. **Energy Efficiency Requirement**
   - (i) Minimum Energy-Efficiency Requirements for New Installation and Replacement of Systems and Equipment in Buildings
   - (ii) Replacement of Components of Systems and Equipment in Buildings
   - (iii) Criteria for Determining Compliance with Energy Efficiency in Building with Regards to Air conditioning and Heat Rejection Equipment, Water Heaters, Motor Drives and Lighting used in Buildings
4. **Protection for Safety**
   - (i) Principle of Operation of Protective Devices
   - (ii) Maximum Demand and Diversity Factors

(iii) Protection Against Over-current and Short Circuits

(iv) Protective Devices and Circuit Conductors

(v) Discrimination in Protection of Electrical Circuits

5. Cables, Bus-ways and Distribution Boards

(i) Type and Characteristic of Cables

(ii) Method of Installation

(iii) Sizing of Conduit and Trunking

(iv) Factors Affecting the current Carrying Capacities of Cables

(v) Sizing of Cables and Bus-ways for use Under Different Types of Conditions

(vi) Connected Load, Maximum Demand and Circuit Breakers Ratings For a Electrical Distribution Board

6. Earthing

(i) Purpose of Earthing

(ii) Methods of Earthing

(iii) Earth Fault Loop Impedance and Earth Fault Current

(iv) Suitable Sizes of Circuit Protective Conductor

(v) Testing of Earthing

7. Emergency Lighting

(i) Exit and Emergency Lighting Requirements for Evaluation of Occupants

(ii) Types of Back-up Power Supply

(iii) Exit and Directional Signs

8. Standby Power Generator System

(i) Types of Essential and Critical Loads

(ii) Sizing of Generator

(iii) Voltage Regulation and its Effects on Generator Sizing

(iv) Protection of Alternator and Prime movers

(v) Installation of Standby Generator System Including Day-tank, Battery and charger, Full supply, Engine cooling system, plant room ventilation, exhaust and fresh air intake, contend instrumentation plant and automatic transfer switch

9. **Automatic Fire Alarm System**

(i) Requirement for automatic and manual fire detection system and purpose of compartmentation as required by the fire code

(ii) Interaction with other building services such as emergency voice communication system, lifts, AHU, pressurization fans and auto-doors during alarm activation

10. **Emergency Voice Communication System**

(i) Requirements for public address system for building above 24 meters but less than 60 meters.

(ii) Requirements for emergency voice communication for building above 60 meters

(iii) Requirements for fireman intercom

11. **Inspection, Testing, and Common Violation in Electrical Installation**

(i) Mandatory requirements for inspection and testing of electrical prior to energisation of electrical supply

(ii) Types of test instruments and standard methods of testing

12. **Measuring Instruments**

(i) Principle of operation of Electrical Measuring Instruments

(ii) Essential of Indicating Instruments

(iii) Types of Instruments

(iv) Errors Common to All Types of Instruments

(v) Moving Iron Instruments

(vi) Moving Coil Instruments

(vii) Comparison Between Moving Iron and Moving Coil Instruments

(viii) Comparison Between Moving Iron and Dynamometer Type Instruments

(ix) Extension of Instrument Range

(x) Measurement of power

(xi) Wattmeter, Dynamometer Type Wattmeter

(xii) Energy Meter, Multimeter or AVO meter, Electronic Multimeter,

(xiii) Digital Multimeter

13. Electrical Engineering Codes/Standards

(i) Codes, standards and Regulations

(ii) Codes and standards for building services.

REFERENCES

1. Basic Electrical & Electronics engineering by J.B GUPTA

2. Electrical Installation Calculations (advanced) by A.J Watkins Charis Kitcher

3. Practice of professional engineering Examination 2012 (Professional Engineering Board Singapore)

4. Code of Practice for "Protection against Lightning" Singapore Standard SS555

5. Code of Practice for Electrical Installations CP 5 Singapore Standard

6. IEC Regulation, Electrical Building Services

7. IEE Wiring Regulations

SCOPE (Electronic PE)

I. **General Electrical Engineering Knowledge**

A. Circuit Components
   1. Passive Components
   2. DC Circuits
   3. Sinusoidal analysis
   4. Transient analysis
   5. Power and energy calculations

B. Measurement and Instrumentation
   1. Transducer and System Characteristics
   2. Operational Amplifier

C. Signal Processing
   1. Sampling Theory
   2. Analog-to-digital (A/D) and digital-to-analog (D/A) Conversions

II. **Digital Systems**

A. Digital Logic
   1. Bolean algebra
   2. Combinational and sequential logic

B. Digital Components
   1. Digital devies
   2. Memory devices
   3. Programmable logic devices
   4. Microcontrollers / embedded systems

III. **Electric and Magnetic Field Theory and Applications**

A. Electromagnetic Fields
   1. Theory
   2. EMI / EMC

B. Transmission Lines and Guided Waves
   1. Transmission lines, balanced and unbalanced
   2. Waveguides

C. Antennas
   1. Gain, patterns, and polarization
   2. Impedance

IV. Electronics

A. Electronic Circuit Theory
   1. Small-signal and large-signal models
   2. Active networks and filters
   3. Nonlinear circuits (e.g., comparators)
   4. Sinusoidal steady-state analysis
   5. Transient analysis
   6. Power and energy calculations

B. Electronic Components and Circuits
   1. Solid-state power devices and power electronics applications
   2. Battery characteristics and ratings
   3. Power supplies
   4. Oscillators and phase-locked loop characteristics
   5. Amplifiers
   6. Modulators and demodulators
   7. Diodes
   8. Circuit protection and safety
   9. Transistors and applications

V. Control System Fundamentals

A. Block diagrams
B. Characteristic equations
C. Frequency response
D. Time response
E. Control system design and implemetation (e.g., compensators, steady-state error)
F. Stability (e.g.,tests, Bode plots, root locus, transport delay)

VII. Communications

A. Modulation
   1. Analog modulation
   2. Digital modulation
   3. Spread spectrum modulation characteristics

B. Noise and Interference
   1. Signal-to-noise ratio
   2. Quantization noise
   3. Noise figure and temperature
   4. Interference
   5. Coding, error detection and correction

C. Telecommunications

1. Wireline communications
2. Wireless communications
3. Optical communications
4. Multiplexing
5. Traffic and switching

VIII. Programming

1. Overview of Computer and Computer System
2. C and C++ fundamentals
3. Branching
4. Looping
5. Files
6. Functions
7. Pointers, Arrays and Strings

IX. Microprocessor System

1. Introduction to Microprocessor System
2. Architecture of the 8088/ 8086 Microprocessor
3. Addressing Modes
4. Assembly Language Programming
5. The architecture of Intel microprocessor families

X. Computer Archintecture and Engineering

1. Classic components of a computer
2. Measuring Performance
3. Major factors for performance of a computer
4. MIPS assembly Language Programming

(Electronic PE)

REFERENCES

1. Electronic Devices by FLOYD
2. Electronic Devices and Circuits by BOGART
3. Electronic Communications (Modulation and Transmission) by ROBERT J.SCHOENBECK
4. Digital Fundamentals by THOMAS L.FLOYD
5. Engineering Circuit Analysis
6. Computer Organization and Design by DAVID A.TATTERSON and JOHN L.HENNESSY
7. Electronmaganetic Fields
8. Transmission Lines and Guided Waves
9. Antennas
10. Electronic Communication Techniques by YOUNG (or) other authers
11. Principles of Communication Systems
12. Analog Electronics
13. Advanced Electronic Communication Systems
14. Optical Communications
15. Radar Communications
16. Satellite Communications
17. Wireless Communication Systems
18. Electronic Communication Systems
19. Electronic Control System
20. Modeling and Control
21. Radio Wave Propagation
22. RF and Microwave
23. Modern Control System
24. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by Walter A. Triebel, Avatar Singh
25. Computer Organization and Design by David A. Patterson, John L.Henessy.

SCOPE (Water Resources PE)

I. **Fundamental of Engineering -Refer to Fundamentals of Engineering** Supplied - Reference Handbook, Seventh Edition

II. **Knowledge on Engineering Theories**

(A). Hydraulics

(1) Hydraulics and Fluid Mechanics
(2) Open Channel Flow
(3) Pipe Flow
(4) Design and construction of Hydraulic structures

(B) Hydrology

(1) Meteorology
(2) Surface flow
(3) Groundwater flow
(4) Erosion and Sedimentation

(C) Geotechnical

(1) Soil Mechanics
(2) Engineering Geology
(3) Foundation

(D) Water Management

(1) Soil Science
(2) Crop Water Requirement

(E) Environment

(1) Watershed Management
(2) Water quality
(3) EIA, SIA, EMP
(4) Basin Management

(F) Engineering Economy

(1) Estimating Quantity and cost
(2) EIRR, FIRR

III. **Knowledge on Professional Practice**

(A) Investigation

(1) Surveying
(2) Hydrology
(3) Geology
(4) Soil

(B) Design

(1) Design Criteria and practice

(C) Construction

(1) Construction Management

(D) Quality control and Quality Assuring

(1) Field investigation

(2) Laboratory experience

(E) Operation and Maintenance

(1) Rules and Regulation

IV. Codes, Laws, Bylaws, Regulation, Acts

(1) Water Resources and River conservation Law

(2) Environmental law

(3) Land Revenue and Fishery Law

(4) Canal and Embankment Act

SCOPE (Water Supply and Sanitation PE)

I. **Water Supply**

(A) Water Treatment
1. Water Quality
2. Treatment Process
3. Treated water quality

(B) Water Supply
1. Source
2. Population
3. Water demand
4. Water distribution system
5. Pipe, Fitting and machinery specifications

(C) Plumbing Works
1. Storage
2. Loading unit & design flow
3. Hot water supply system
4. Cold water supply system
5. Provention of recontamination

(D) Sanitation
1. Building sewer / drainage system
2. Collection system
3. Quantity and quality of waste water
4. Treatment system both on site & off site
5. Effluent quality
6. Disposal

(E) Rain Water
1. Run off quantity
2. Drainage system

II. **Code, Standard & Specification for construction installation of w/s works**

III. **Code, Standard & Specification for maintenance of w/s works**

IV. **Ethics**

SCOPE (Civil Bridge PE)

1. Investigation of Bridges and Culverts
2. Investigations for Important Bridges
3. Design Flood Discharge for Bridges
4. Linear Waterway of Bridges
5. Choice of Foundations for Piers and Abutments
6. Types Bridges and Loading Standards
7. Setting Out for Piers and Abutments
8. Open Foundation
9. Pile Foundation
10. Well Foundation
11. Well Foundation - Case Studies
12. Pires and Abutments
13. Superstructure - Design Aspects
14. Superstructure - Construction
15. Inspection of Bridges
16. Maintenance of Bridges - Substructures
17. Maintenance of Superstructure - Girders
18. Rebuilding of Bridges
19. Construction Management
20. Grade Separators
21. River Training and Protection Works

(Civil Bridge PE)

REFERENCES

1. Bridge Engineering (Second Edition) by S. Ponnuswamy
(Tata Mc.Graw - Hill Publishing Co.,Ltd) (Available at MES Reference Library)
2. AASHTO Specifications for Highway Bridges

Core Engineering Competencies

A. Apply engineering knowledge, methods and techniques
Definition
Solves engineering problems using appropriate theoretical and practical engineering principles.
Indicators
Defines potential issues or opportunities.
Collects and analyses relevant data.
Identifies alternate solutions based on feasibility, technology and economic assessments.
Develops solutions that achieve system requirements and specifications.
Selects and applies appropriate testing methodologies and techniques to verify that solutions meet specifications, codes and standards.
Implements engineering solutions.
Evaluates effectiveness of engineering solutions (i.e. practicality, constructability).

Note: This competency is about assessing an applicant;s ability to solve engineering problems (by identifying alternate solutions)

B. Use engineering technology, tools and equipment
Definition
Uses appropriate technology and engineering tools based on sound understanding of engineering principles.
Indicators
Selects relevant technology for solutions to engineering problems.
Uses, or monitors the use of, technology to solve engineering problems.
Verifies the reliability of the use of technology, tool or equipment.
Verifies the effectiveness of the use of technology, tool or equipment.
Evaluates the limitations of the technology and how it can be applied.
Understands the underlying principles behind the technology and its application.

Note: This competency addresses both the "hands-on" aspect of engineering and demonstration of field experience, as well as the importance of using up-to-date technology, tools and equipment.

C. Safeguard public safety
Definition
Practises engineering activities holding paramount the safety, health and welfare of the public; the protection of the environment; and the safeguarding of economic interests.
Indicators
Adheres to legislations, regulations and policies within all jurisdictional levels.
Complies with all applicable codes and standards.
Assesses risk and safety concerns of engineering activities to identify hazards and potential harm.
Implements practices to protect health and safety of the public.

Note: Reference to the public in this competency includes one self and colleagues

D. Recognize the impacts of engineering on the environment, economy and society
Definition
Develops engineering solutions that are based on a sound understanding of their impacts on the environment, economy and society.
Indicators
Indentifies the types of assessments and consultations required.
Assesses, to the extent possible, long term environmental and substainability issues associated with engineering activities.
Assesses, to the extent possible,the economic and social impacts of engineering.
Recommends engineering solutions that consider assessment findings.

Note: The word "develops" is used to highlight the fact that solutions may be proposed, but not implemented. This competency addresses the professional engineer's responsibility to consider the social implications of engineering activities.

E. Manage engineering activities
Definition
Applies the principles of sound management when conducting engineering activities including individual work.
Indicators
Conducts activities with an accurate understanding of expectations and needs.
Develops or implements schedules or budgets.
Manages the interplay of schedule, resources, quality and budget.
Manages risks.
Measures outcomes.

Note: This competency addressess the importance of proper work management practices_for projects or for individual undertakings.

F. Communicate engineering information
Definition
Effectively communicates engineering information verbally, graphically and in writing.
Indicators
Tailors communications to the audience and clarifies complex and technical information.
Presents information clearly and concisely.
Verifies audience's understanding.
Listens actively and confirms own understanding.
Prepares correspondence, reports, records, or drawings.
Keeps clear and comprehensive records of engineering decisions, and supporting documentation (e.g. design record).

Note: This competency goes beyond language skills to address two-way communication. Applicants who do not communicate verbally due to a disability would demonstrate "verbal" communication through another interactive form of communication (i.e. sign, voice output communication aids,etc.)

G. Work collaboratively
Definition
Works effectively to achieve societal, organizational and project goals in a collaborative manner.
Indicators
Shares relevant information, key knowledge and expertise with others.
Respects contributions of other professionals and colleagues at all levels.
Offers assistance to others when needed.
Resolves difficult interpersonal situations using tact and honesty.
Handles disagreement promptly, seeking mutually agreeable solutions.
Demonstrates sensitivity, and respect in interactions with diverse individuals and groups in ways that advance the achievement of team or organizational goals.

Note: The competency addresses the ability to work with diverse groups, demonstrating the respect and professionalism necessary to succeed.

H. Maintain and Enhance Engineering Skills and Knowledge
Definition
Takes actions to maintain and enhance proficiency in the practice of engineering activities.
Indicators
Addresses inadequacies in knowledge and skills through further study and consultation with others.
Engages in continuous learning activities (e.g., professional readings, courses, self-study, receiving coaching or mentoring, experiential learning).
Integrates general knowledge of current events and issues to one's own engineering practice.
Keeps current with the dynamic nature of engineering (including advances in knowledge and technological advancements.
Conducts self assessment..
Develops learning plan.

Note: This competency addresses the importance of keeping skills up-to-date, keeping current with the dynamic nature of engineering, and addressing any gaps through continuous learning.

Assessment Group

Name of P.E Applicants.....

NRC No.....

PROFESSIONAL ASSESSMENT

Sr. no	Description	Maximum Marks	Remarks of Assessor	Marks Attained
	Knowledge			
1	Knowledge on Fundamentals of Engineering			
2	Knowledge on Engineering Theories			
	Standards			
3	Knowledge on Rules and Regulations			
4	Knowledge on Standards and Specifications			
	Experience			
5	Knowledge on Professional Practices			
6	Experiences on his or her Profession			
7	Competence in his or her Profession			
	Safety and Ethics			
8	Knowledge on Safety			
9	Knowledge and awareness on Ethics			
	Skills			
10	Management Skill and knowledge			
11	Communication Skill and Presentation			
12	Computer Skill, Software knowledge			
	Others			
13	Quality of Technical Report			
14	Is he or she practicing?			
	Total			
Note				
(a)	Does he or she need to study more (Decision)			
(b)	Does he or she need to get more experiences (Decision)			

Acceptable

Not Acceptable

Signature of Assessor.....

Name of Assessor.....

Date.....